

REMARKS

The Office Action dated August 1, 2007, has been received and carefully noted. The above amendments and the following remarks are submitted as a full and complete response thereto.

By this Amendment, the Abstract and claims 1-17 are amended. No new matter is presented. Support for the amendments to claim 1 can be found in Figs. 1-8 of the application as originally filed. Claim 2 is amended to correspond with the recitation of amended claim 1. Claim 9 is amended to correct a typographical error, which is apparent from the disclosures of Figs. 5-8 of the application. Claims 1-17 are pending and respectfully submitted for consideration.

Allowable Subject Matter

The Applicants wish to thank the Examiner for indicating allowable subject matter in claims 4-9 and 12-17. Claims 4-9 and 12-17 are not amended as they depend from claim 1, which is allowable for the reasons submitted below.

Oath or Declaration

The Office Action stated that the Oath or Declaration is defective. The Applicants have amended the Declaration and submit herewith a substitute Declaration correcting the citizenship information for each inventor. The Applicants respectfully request that the substitute Declaration be entered.

Information Disclosure Statement

The Applicants note that the Information Disclosure Statement (IDS) submitted on May 8, 2007, was not considered. In particular, the Applicants note the Examiner's strikethrough of the Japanese Patent Application Publications Nos. 6-280523 and 61-

88009 stating that the references were non-existing. However, the Applicants respectfully submit that the references were submitted with the IDS and are retrievable from the U.S. Patent and Trademark Office PAIR database. As such, the Applicants respectfully request that the references were submitted and were available for consideration. Accordingly, the Applicants respectfully request consideration of the references filed in the IDS on May 8, 2007.

Rejections under 35 U.S.C. § 102 and § 103

Claims 1-3, 10 and 11 are rejected under 35 U.S.C. § 102(b) as being anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as being obvious over Takenaka (Japanese Patent Publication No. 06-280523).

Takenaka discloses a valve system for an internal combustion engine. In the valve system, one of end of a first support link 9₁ is connected to a rocker arm 4₁ to be in sliding contact with a cam 3 and connected to an engine valve V. The support link 9₁ is oscillatably supported at a fixation position of an engine main body E. A second support link 10 has one end connected to the rocker arm 4₁ at a position different from the first support link 9₁ and the other end oscillatably supported to the engine main body E at a continuously movable fulcrum 111. See the English language Abstract of Takenaka.

Claims 1 and 2 are rejected under 35 U.S.C. § 102(b) as being anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as being obvious over Fukuma (Japanese Patent Publication No. 5-340227).

To the extent that the above-noted rejections remain applicable to the claims currently pending, the Applicants traverse the rejections and respectfully submit that

claims 1-3, 10 and 11 recite subject matter that is neither disclosed nor suggested by the cited references.

In the present invention, certain factors are to be considered when designing the valve motion in valve-operating systems using a rocker arm. That is, in a valve-operating system using a rocker arm, the weights of constituents providing the valve operating function, valve-lift curve (= acceleration), spring constant of a valve spring, and the rigidity of the rocker arm are important factors.

As a result of the claimed invention recited in amended claim 1, the rocker arm is formed to be gradually thicker from the valve abutment at one end thereof toward the cam abutment at the other end and a pair of link arms is directly connected to the other end of the rocker arm. Owing to this arrangement, the starting point of valve-lift curve at the maximal acceleration is to be located at the other end of the rocker arm, that is, at the portion having an extremely high rigidity, so that any undesirable deformation and bending of the rocker arm can be prevented, thereby suppressing abnormal motion of the rocker arm.

The Applicants respectfully submit that Takenaka fails to teach or suggest a rocker arm formed to be gradually thicker from the valve abutment at the one end toward the cam abutment at the other end, as recited in amended claim 1.

In contrast, Takenaka shows, in Fig. 6 for example, that cam 3 is in abutment against an intermediate portion of rocker arm 4₂ which extends with substantially the same width or thickness from its right end abutting against valve V. In other words, cam 3 in Takenaka abuts against a low rigid portion of rocker arm 4₂. The Applicants respectfully submit that, with this structure in Takenaka, at the time of maximal

acceleration obtainable from the valve-lift curve, the rocker arm 4₂ bends with its starting point on its intermediate portion placed in abutment against cam 3, whereby in the course of valve opening, this cause a flapping phenomenon where the valve-lift curve deviates from its normal shape, while in the course of valve closing, i.e., at the time of valve seating, an abnormal motion such as "bouncing" may occur. "Bouncing" is a motion of the valve that causes the valve to open when it should be closed. Bouncing in an intake valve prevents compression by a piston from being carried out normally, leading to a lowering in real compression ratio. Since thermal efficiency is determined almost solely by the real compression ratio, "bouncing" means a lowering in thermal efficiency, thereby disadvantageously affecting the fuel consumption, output, exhaust emission and the like of an internal combustion engine.

In addition to the above, according to the invention, as recited in claim 1, the valve abutment at one end of the rocker arm is formed thinner than the cam abutment at the other end of the rocker arm. The valve abutment, which does not require a high rigidity, can be of a light weight so that the rocker arm can be light-weighted as a whole while ensuring a required rigidity. This enables the upper limit of revolution for the valve operation constituents to be raised largely. Moreover, the light-weight of the rocker arm directly serves to suppress a valve bouncing motion, which is an abnormal motion. As a result, a valve spring of a low spring constant can be used, leading to a lower friction at the valve operation constituents. Therefore, the invention, as recited in claim 1 contributes to improvements in fuel consumption and exhaust emission.

Fukuma shows in Figs. 14-18 a rocker arm 54 that extends from its left end (valve abutment) toward its right end (behind reference numeral 66 in Fig. 18) while

having its width increased at its intermediate portion placed in abutment against cam 50. Fukuma does not disclose directly connecting two links to the thickest end of such rocker arm 54 at which the rocker arm abuts against cam 50. As such, Fukuma fails to disclose or suggest the claimed features of the invention as recited in amended claim 1.

With respect to claim 2, the Applicants respectfully submit that Fukuma does not disclose or suggest the claimed features of the invention. Claim 2 recites that the link arms are connected at the other ends in a row. In contrast, Fukuma discloses that both of the other ends of the link arms 56b and 67 pivot at the same point 66 as shown in Figure 18 of Fukuma. As such, the ends that are connected directly to the rocker are not connected in a row. As such, the Applicants respectfully request withdrawal of the rejection of claim 2 in view of Fukuma.

Claims 1 and 2 are rejected under 35 U.S.C. § 102(b) as being anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as being obvious over Cecur (European Patent Application No. EP 0995885A2). The Applicants traverse the rejection and respectfully submit that claims 1 and 2 recite subject matter that is neither disclosed nor suggested by Cecur.

Cecur discloses a valve control system including a valve actuating camshaft (A) having a high lift cam (B) and a low lift cam (C), and an outer rocker arm (2) engaging the high lift cam, and an inner rocker arm (3) engaging the low lift cam. The ends of the rocker cams adjacent the engine poppet valve (V) are fixed to each other by a connector pin (37). The system includes a latching mechanism disposed at the ends of the rocker arms opposite the connector pin (37). Latching of the rocker arms is

accomplished by a compound pin (8) moved between latched and unlatched conditions in response to movement of an actuator (9). See the Abstract of Cecur.

With respect to claim 1, the Applicants respectfully submit that Cecur fails to disclose or suggest the claimed features of the invention. Claim 1 recites a pair of link arms each of which is supported at one end thereof on an engine body for swinging movement about an axis parallel to a rotational axis for the valve-operating cam and connected at the other end directly to the other end of the rocker arm. The Office Action asserts that the inner rocker arm 3 in Cecur is comparable to one of the claimed pair of link arms. However, the inner rocker arm 3 is connected at both ends to the outer rocker arm 2. The pin 37 connects the two rocker arms 2 and 3 for either common action or separate action of these arms on the engine poppet valve V. There is no disclosure or suggestion that either the inner or outer rocker arms are supported at one end thereof on an engine body for swinging movement around an axis parallel to a rotational axis for the cam (C). As such, Cecur does not disclose or suggest the features of the invention as recited in claim 1.

In view of the above, the Applicants respectfully submit that Takenaka, Fukuma and Cecur do not disclose or suggest each and every feature of the invention as recited in claim 1.

To qualify as prior art under 35 U.S.C. § 102, each and every feature recited in a rejected claim must be disclosed by the applied art. Accordingly, Takenaka, Fukuma and Cecur do not anticipate claim 1, nor is claim 1 obvious in view of Takenaka, Fukuma and Cecur. Therefore, the Applicants submit that claim 1 is allowable over Takenaka, Fukuma and Cecur.

To establish a *prima facie* case of obviousness, each and every feature of a rejected claim must be taught or suggested by the applied art of record. See M.P.E.P. § 2143.03.

In view of the above, the Applicants respectfully submit that Takenaka, Fukuma and Cecur fail to support a *prima facie* case of obviousness for purposes of a rejection of claim 1 under 35 U.S.C. § 103. Accordingly, claim 1 is not rendered obvious in view of Takenaka, Fukuma and Cecur and should be deemed allowable.

Conclusion

The Applicants submit that claim 1 is allowable. Claims 2, 3, 10 and 11 depend from claim 1. The Applicants further submit that each of these claims incorporate the patentable aspects thereof, and are therefore allowable for at least the same reasons as discussed above. Accordingly, the Applicants respectfully request withdrawal of the objections and rejections, allowance of claims 1-17 and the prompt issuance of the Notice of Allowability.

Should the Examiner believe anything further is desirable in order to place this application in better condition for allowance, the Examiner is requested to contact the undersigned at the telephone number listed below.

In the event this paper is not considered to be timely filed, the Applicants respectfully petition for an appropriate extension of time. Any fees for such an extension, together with any additional fees that may be due with respect to this paper, may be charged to counsel's Deposit Account No. 01-2300, **referencing Attorney Dkt. No. 107348-00449.**

Respectfully submitted,



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Enclosures: Substitute Abstract
Substitute Declaration

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